

## CLAIMS

### WHAT IS CLAIMED IS:

1. A vehicle antenna system, comprising:  
a first directional antenna and a second directional antenna, said first- and second-directional antennae being located on an exterior mirror of a vehicle and having first- and second-directional signal detection fields, respectively;  
5 a switching network that selects one of said first- and second-directional antennae to be a selected antenna;  
a receiver coupled to said switching network to receive a selected antenna signal from the selected antenna via said switching network; and  
a controller coupled to the receiver to output a control signal corresponding to  
10 the antenna signal received by the receiver.
2. The vehicle antenna system of claim 1, further comprising:  
a detector connected between said receiver and said controller; and  
a peak detector connected between said detector and said controller,  
15 wherein said detector detects an amplitude of the selected antenna signal and outputs a detector signal corresponding to the selected antenna signal's amplitude to said peak detector and said controller,  
wherein said controller compares the amplitude of the selected antenna signal's amplitude to at least one previous peak amplitude, saves a peak value and outputs a  
20 peak detector signal corresponding to the peak value to said controller, and  
wherein said controller compares the detector signal for each of said first- and second-directional antennae with the peak detector signal to identify which of said antennae outputs the strongest antenna signal.
3. The vehicle antenna system of claim 2, wherein the detector signal is a  
25 digital detector signal, and wherein the system further comprises an analog-to-digital

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converter connected between said peak detector and said controller to convert the peak detector signal into a digital peak detector signal.

4. The vehicle antenna system of claim 2, wherein said peak detector  
5 further comprises a reset portion for resetting the peak value.

5. The vehicle antenna system of claim 1, further comprising at least one  
matching network connected between said first- and second-directional antennae and  
said switching network.

10 6. The vehicle antenna system of claim 5, wherein each of said first- and  
second-directional antennae has a corresponding matching network.

15 7. The vehicle antenna system of claim 2, further comprising a plurality  
of tire pressure sensors, each tire sensor transmitting a sensor output signal detectable  
by at least one of said first- and second-directional antennae.

20 8. The vehicle antenna system of claim 7, further comprising:  
a threshold detector that compares the detector signal for each of said first- and  
second-directional antenna with a predetermined threshold; and  
a low pressure warning indicator coupled to the threshold detector to indicate  
when the detector signal falls below the predetermined threshold, indicating low tire  
pressure.

25 9. The vehicle antenna system of claim 7, wherein each tire pressure  
sensor has a sensor transmission field, and wherein the sensor transmission field  
overlaps at least one of said first- and second-directional signal detection fields.

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10. The vehicle antenna system of claim 1, further comprising:  
a signal generator that generates a system output signal for reception by a  
remote circuit external to the vehicle; and

5 a transmitter for transmitting the system output signal to the remote circuit via  
said at least one of said first- and second-directional antennae over first- and second-  
directional transmission fields, respectively.

10 11. The vehicle antenna system of claim 10, wherein the remote receiver is  
located on a vehicle diagnostic computer, and wherein said signal generator generates  
vehicle diagnostic data.

15 12. The vehicle antenna system of claim 10, wherein the remote receiver is  
located on a garage door opener, and wherein said signal generator generates  
conventional garage door opener operation data.

13. The vehicle antenna system of claim 10, wherein the remote receiver is  
located on a traffic control system, and wherein said signal generator generates a  
presence signal to indicate the presence of the vehicle at a street intersection.

20 14. The vehicle antenna system of claim 1, wherein at least one of said  
first- and second-directional antennae receives an input signal from a remote location  
outside of the vehicle.

25 15. The vehicle antenna system of claim 14, wherein the input signal is  
transmitted by an emergency vehicle.

30 16. The vehicle antenna system of claim 15, wherein a remote receiver is  
located on a traffic control system, and wherein the emergency vehicle transmits the  
input signal to both the remote receiver and at least one of said first- and second-  
directional antennae.

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17. The vehicle antenna system of claim 1, further comprising:  
a signal generator that generates a system output signal for reception by a  
remote receiver external to the vehicle; and

5 a transmitter for transmitting the system output signal to the remote circuit via  
said first- and second-directional transmission fields, wherein at least one of said first-  
and second-directional signal detection fields detect a signal from the remote circuit.

10 18. The vehicle antenna system of claim 17, wherein the remote circuit is  
located in a vehicle access gate, and wherein the signal generator generates and  
transmits an access code, vehicle identification and/or payment information.

15 19. The vehicle antenna system of claim 17, wherein the first- and second-  
directional antennae transmit and receive telephone signals to and from the remote  
circuit.

20 20. The vehicle antenna system of claim 17, wherein the remote circuit is  
in a global positioning satellite, and wherein the first- and second-directional antennae  
transmit and receive global positioning information to and from the satellite.

21. A vehicle antenna system, comprising:  
a first directional antenna and a second directional antenna, said first- and  
second-directional antennae being located on an exterior mirror of a vehicle and  
having first- and second-directional signal transmission fields, respectively;

25 a signal generator that generates a system output signal for reception by a  
remote receiver outside to the vehicle; and

a transmitter for transmitting the system output signal to the remote circuit via  
at least one of said first- and second-directional antennae.

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22. The vehicle antenna system of claim 21, wherein the remote circuit is located in a vehicle access gate, and wherein the signal generator generates an access code and the system output signal is vehicle identification and/or payment information.

23. The vehicle antenna system of claim 21, wherein said first- and second-directional antennae transmit telephone signals to the remote circuit.

24. The vehicle antenna system of claim 21, wherein the remote circuit is in a global positioning satellite, and wherein at least one of said first- and second-directional antennae receive global positioning information therefrom.

25. The vehicle antenna system of claim 1, wherein said first directional antenna is a forward-directed antenna and said second directional antenna is a rearward-directed antenna.

26. A vehicle antenna system, comprising:

a first first-directional antenna and a corresponding <sup>2nd</sup> first first-directional antenna, said first first- and second-directional antennae being located on a first exterior mirror of a vehicle and having first first- and second-directional signal detection fields, respectively;

a second first-directional antenna and a corresponding second second-directional antenna, said second first- and second-directional antennae being located on a second exterior mirror of a vehicle and having second first- and second-directional signal detection fields, respectively;

a switching network that selects one of said first and second forward and rearward-directed antennae to be a selected antenna;

a receiver coupled to said switching network to receive a selected antenna signal from the selected antenna via said switching network; and

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a controller coupled to the receiver to output a control signal corresponding to the antenna signal received by the receiver.

27. The vehicle antenna system of claim 26, further comprising:  
5 a detector connected between said receiver and said controller; and  
a peak detector connected between said detector and said controller,  
wherein said detector detects an amplitude of the selected antenna signal and  
outputs a detector signal corresponding to the selected antenna signal's amplitude to  
said peak detector and said controller,  
10 wherein said peak detector saves a peak value and outputs a peak detector  
signal corresponding to the peak value to said controller, and  
wherein said controller compares the peak detector signal for each of said first  
and second first- and second-directional antennae to identify which of said antennae  
outputs the strongest antenna signal.

15 28. The vehicle antenna system of claim 27, wherein the detector signal is  
a digital detector signal, and wherein the system further comprises an analog-to-digital  
converter connected between said peak detector and said controller to convert the peak  
detector signal into a digital peak detector signal.

20 29. The vehicle antenna system of claim 28, wherein the digital detector is  
a pulse width modulated signal.

25 30. The vehicle antenna system of claim 27, wherein said peak detector  
further comprises a reset portion for resetting the peak value.

31. The vehicle antenna system of claim 26, further comprising at least one  
matching network connected between said first and second first- and second-  
directional antennae and said switching network.

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~~claim 27~~

f claim 3

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a transmitter for transmitting the system output signal to the remote circuit via at least one of said first and second first- and second-directional antennae over first and second first- and second-directional transmission fields, respectively.

37. The vehicle antenna system of claim 36, wherein the remote circuit is located on a vehicle diagnostic computer, and wherein said signal generator generates vehicle diagnostic data.

38. The vehicle antenna system of claim ~~36~~, wherein the remote circuit is  
10 located on a garage door opener, and wherein said signal generator generates  
conventional garage door opener operation data.

39. The vehicle antenna system of claim 36, wherein the remote receiver is located on a traffic control system, and wherein said signal generator generates a presence signal to indicate the presence of the vehicle at a street intersection.

40. The vehicle antenna system of claim 26, wherein at least one of said first and second first- and second-directional antennae receives an input signal from a remote location outside of the vehicle.

41. The vehicle antenna system of claim 40, wherein the input signal is transmitted by an emergency vehicle.

42. The vehicle antenna system of claim 41, wherein a remote receiver is  
25 located on a traffic control system, and wherein the emergency vehicle transmits the  
input signal to both the remote receiver and at least one of said first and second first-  
and second-directional antennae.



43. The vehicle antenna system of claim 26, further comprising:  
a signal generator that generates a system output signal for reception by a  
remote circuit external to the vehicle; and

5 a transmitter for transmitting the system output signal to the remote receiver,  
and wherein at least one of said first and second first- and second-directional antennae  
receives an input signal from a remote location outside of the vehicle.

44. The vehicle antenna system of claim 43, wherein the remote circuit is  
located in a vehicle access gate, and wherein the signal generator generates an access  
10 code and the input signal is vehicle identification and/or payment information.

45. The vehicle antenna system of claim 43, wherein at least one of first  
and second first- and second-directional antennae transmit and receive telephone  
signals to and from the remote circuit.

15 46. The vehicle antenna system of claim 43, wherein the remote circuit is  
in a global positioning satellite, and wherein at least one of said first and second first-  
and second- directional antennae receive global positioning information from the  
satellite.

20 47. A vehicle antenna system, comprising:  
a first first-directional antenna and a corresponding first second-directional  
antenna, said first first- and second-directional antennae being located on a first  
exterior mirror of a vehicle and having first first- and second-directional signal  
25 transmission fields, respectively;  
a second first-directional antenna and a corresponding second second-  
directional antenna, said second first- and second-directional antennae being located  
on a second exterior mirror of a vehicle and having second first- and second-  
directional signal transmission fields, respectively;

a signal generator that generates a system output signal for reception by a remote receiver external to the vehicle; and

a transmitter for transmitting the system output signal to the remote receiver via at least one of said first and second first-directional and second-directional antennae.

48. The vehicle antenna system of claim 47, wherein the remote receiver is located in a vehicle access gate, and wherein the signal generator generates an access code and the input signal is vehicle identification and/or payment information.

49. The vehicle antenna system of claim 47, wherein the first- and second-directional antennae transmit telephone signals to the remote circuit.

50. The vehicle antenna system of claim 47, wherein the remote circuit is in a global positioning satellite, and wherein the first- and second-directional antennae receive global positioning information from the satellite.

51. The vehicle antenna system of claim 47, wherein said first and second first-directional antennae are forward-directed antennae and said first and second second-directional antennae are rearward-directed antennae.

52. A vehicle antenna system, comprising:

a first first-directional antenna and a corresponding first second-directional antenna, said first first- and second-directional antennae being located on a first exterior mirror of a vehicle and having first first- and second-directional signal detection fields, respectively;

a second first-directional antenna and a corresponding second second-directional antenna, said second first- and second-directional antennae being located on a second exterior mirror of a vehicle and having second first- and second-directional signal detection fields, respectively;

at least one matching network corresponding to at least one of said first and second first- and second-directional antennae and said receiver;

a switching network coupled to said at least one matching network, wherein said switching network selects one of said first and second first- and second-

5 directional antennae to be a selected antenna;

a detector connected between said receiver and said controller;

a peak detector connected between said detector and said controller;

a receiver coupled to said switching network to receive a selected antenna signal from the selected antenna via said switching network; and

10 a controller coupled to the receiver to output a control signal corresponding to the antenna signal received by the receiver,

wherein said detector detects an amplitude of the selected antenna signal and outputs a detector signal corresponding to the selected antenna signal's amplitude to said peak detector and said controller,

15 wherein said peak detector compares the amplitude of the selected antenna signal's amplitude to at least one previous peak amplitude of a previous selected antenna signal, saves a peak value and outputs a peak detector signal corresponding to the peak value to said controller, and

20 wherein said controller compares the detector signal for each of said first and second first- and second-directional antennae with the peak detector signal to identify which of said antennae outputs the strongest antenna signal.

53. The vehicle antenna system of claim 52, wherein the detector signal is a digital detector signal, and wherein the system further comprises an analog-to-digital  
25 converter connected between said peak detector and said controller to convert the peak detector signal into a digital peak detector signal.

54. The vehicle antenna system of claim 52, wherein said peak detector further comprises a reset portion for resetting the peak value to a predetermined value  
30 after the strongest antenna signal has been identified.

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55. The vehicle antenna system of claim 52, further comprising a plurality of tire pressure sensors, each tire sensor transmitting a sensor output signal detectable by at least one of said first and second first- and second-directional antennae.

5 56. The vehicle antenna system of claim 55, further comprising:  
a threshold detector that compares the detector signal for each of said forward and rearward-directed antenna with a predetermined threshold; and  
a pressure warning indicator coupled to the threshold detector to indicate when the detector signal passes the predetermined threshold, indicating an unsafe tire  
10 pressure.

57. The vehicle antenna system of claim 55, wherein each tire pressure sensor has first- and second-directional transmission fields, and wherein at least one of said first- and second-directional transmission fields overlaps one of said first and  
15 second first- and second-directional signal detection fields.

58. The vehicle antenna system of claim 52, further comprising:  
a signal generator that generates a system output signal for reception by a remote receiver external to the vehicle; and  
20 a transmitter for transmitting the system output signal to the remote receiver.

59. The vehicle antenna system of claim 57, wherein the remote receiver is located on a vehicle diagnostic computer, and wherein said signal generator generates vehicle diagnostic data.

25 60. The vehicle antenna system of claim 57, wherein the remote receiver is located on a garage door opener, and wherein said signal generator generates conventional garage door opener operation data.

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61. The vehicle antenna system of claim ~~57~~, wherein the remote receiver is located on a traffic control system, and wherein said signal generator generates a presence signal to indicate the presence of the vehicle at a street intersection.

5 62. The vehicle antenna system of claim ~~51~~, wherein at least one of said first and second first- and second-directional antennae receives an input signal from a remote location outside of the vehicle.

10 63. The vehicle antenna system of claim ~~62~~, wherein the input signal is transmitted by an emergency vehicle.

15 64. The vehicle antenna system of claim ~~62~~, wherein a remote receiver is located on a traffic control system, and wherein the emergency vehicle transmits the input signal to both the remote receiver and at least one of said first and second first- and second-directional antennae.

20 65. The vehicle antenna system of claim ~~51~~, further comprising:  
a signal generator that generates a system output signal for reception by a remote receiver external to the vehicle; and  
a transmitter for transmitting the system output signal to the remote receiver via said first- and second-directional antennae over first- and second-directional fields, wherein at least one of said first- and second-directional signal detection fields detect a signal from the remote circuit.

25 66. The vehicle antenna system of claim ~~64~~, wherein the remote circuit is located in a vehicle access gate, and wherein the signal generator generates and transmits an access code, vehicle identification and/or payment information.

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67. The vehicle antenna system of claim ~~64~~, wherein at least one of the first and second first- and second-directional antennae transmit and receive telephone signals to and from the remote circuit.

5 68. The vehicle antenna system of claim ~~64~~, wherein the remote location is a global positioning satellite, and wherein the first and second first- and second-directional antennae receive global positioning information from the satellite.

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10 69. A vehicle antenna system, comprising:

a first first-directional antenna and a corresponding first ~~first~~-directional antenna, said first first- and second-directional antennae being located on a first exterior mirror of a vehicle and having first first- and second-directional signal transmission fields, respectively;

15 a second first-directional antenna and a corresponding second second-directional antenna, said second first- and second-directional antennae being located on a second exterior mirror of a vehicle and having second first- and second-directional signal transmission fields, respectively;

a signal generator that generates a system output signal for reception by a remote circuit external to the vehicle; and

20 a transmitter for transmitting the system output signal to the remote circuit via at least one of said first and second first-directional and second-directional antennae.

70. The vehicle antenna system of claim ~~69~~, wherein the remote circuit is located in a vehicle access gate, and wherein the signal generator generates an access code and the input signal is vehicle identification and/or payment information.

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71. The vehicle antenna system of claim ~~69~~, wherein the first- and second-directional antennae transmit telephone signals to the remote circuit.

72. The vehicle antenna system of claim 69, wherein the remote circuit is in a global positioning satellite, and wherein the first- and second-directional antennae receive global positioning information from the satellite.

- 5        73. The vehicle antenna system of claim 69, wherein said first and second first-directional antennae are forward-directed antennae and said first and second second-directional antennae are rearward-directed antennae.

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